



Subspecies of the Violet Lacewing, *Cethosia myrina* (Nymphalidae: Heliconiinae), a protected butterfly from Sulawesi

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Abstract. Taxonomic problems concerning the diagnosis and nomenclature of the five subspecies of the protected Sulawesi endemic nymphalid butterfly *Cethosia myrina* are discussed. The correct name for the central and eastern Sulawesi subspecies is deemed to be *C. m. melancholica* Fruhstorfer, 1912, and that of the Buton and Muna subspecies *C. m. vanbemmeleni* Jurriaanse & Lindemans, 1918. *C. m. ribbei* Honrath, 1887, from the Banggai archipelago, is distinct. The nominate subspecies *C. m. myrina* Felder & Felder, 1867, from northern Sulawesi, is shown to be larger than *C. m. sarnada* Fruhstorfer, 1912, from southern Sulawesi, and the latter is reinstated from synonymy. A key to the subspecies and a discussion concerning their ontological status are presented.

Key words: nomenclature, synonymy, original spelling, infrasubspecific names, Sulawesi region

INTRODUCTION

“Our butterflies, sometimes the protected ones are ended up in the international market. An Indonesian protected, the lacewing butterfly (*Cethosia myrina*) can cost \$50 in an internet insect shop.”

<http://wildlifewisdom.wordpress.com/2008/05/07/conservation-shock-one-earth-two-different-stories/>

The Indo-Australian genus *Cethosia* Fabricius, 1807, represents a very distinct clade of about 15 species, seen either as the only Old World representative of the otherwise exclusively neotropical Heliconiinae: Heliconiini (Penz & Peggie, 2003), or as the sister group of the pantropical Heliconiinae: Acraeini (Wahlberg *et al.*, 2009). Within *Cethosia*, *C. myrina* C. & R. Felder, 1867, is a very distinct species (Küppers, 2006; Müller & Beheregaray, 2010). *C. myrina* is endemic to the Sulawesi Region (*sensu* Vane-Wright & de Jong, 2003), occurring widely through much

of the main island of Sulawesi, and it is also known from the offshore islands of the Banggai Archipelago, and Buton and Muna (Fig. 1). According to Müller & Beheregaray (2010), *C. myrina* shares a sister-species relationship with *C. leschenaulti* Godart, 1823, from Timor.

The Violet Lacewing has the unusual distinction of being the only butterfly species other than the CITES-listed native birdwings (*Troides*, *Trogonoptera* and *Ornithoptera* species) currently protected under Indonesian law (Rhee *et al.*, 2004: Appendix 8; Peggie, 2011). Tsukada (1985: 296) recognised five subspecies: the nominate *Cethosia myrina myrina* from northern Sulawesi; the very similar *C. m. sarnada* Fruhstorfer, 1912, from southern Sulawesi; the striking *C. m. ribbei* Honrath, 1887, from Peleng (Banggai archipelago); a distinctive race from Buton island; and a race occurring in central to eastern Sulawesi. This arrangement was followed by Vane-Wright & de Jong (2003) in their synoptic account of the Sulawesi butterfly fauna. However, taxonomic problems have now emerged that potentially affect the delimitation and/or nomenclature of all *C. myrina* subspecies.

Once a taxon is subject to national and or international law, the scientific community should do all it can to ensure that the names applied are as accurate and stable as possible. The purpose of this paper is to review the infraspecific taxonomy of *C. myrina* in the hope of resolving current uncertainties. The following five questions are addressed: what is

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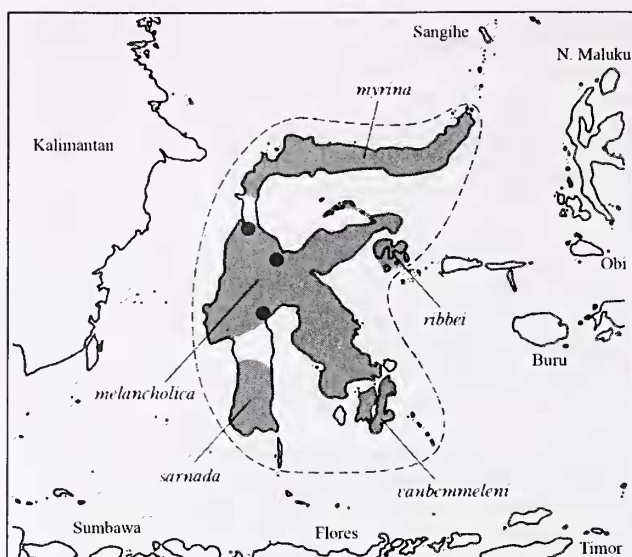


Figure 1. Distribution map of the five subspecies of *Cethosia myrina* recognised in this paper. *C. m. myrina*, *C. m. melancholica* and *C. m. sarnada* occur in separate areas of the main island of Sulawesi (Indonesia). *C. m. ribbei* is restricted to the Banggai archipelago, and *C. m. vanbemmeleni* to the south-eastern islands of Buton and Muna (Küppers, 2006), Muna being the smaller of the two, lying west of Buton. Black spots indicate three localities discussed in the text: Palu (most northerly), Mapane, and Palopo (most southerly). The distributions shown are 'envelopes'. Annotated map based on Tsukada (1985: 296).

the geographical range of the nominate subspecies; what is the taxonomic status of the southern Sulawesi population; what is the valid name for the central to eastern Sulawesi subspecies; what is the taxonomic status of the Banggai Archipelago population; and what is the valid name for the Buton and Muna subspecies?

***Cethosia myrina myrina* C. & R. Felder, 1867 (Figs. 2,3,6,7)**

Cethosia aeole de Haan [MS]; C. & R. Felder, 1860: 103–104, pl. 1, fig. 2. "Celebes". [Misidentification.]

Cethosia myrina C. & R. Felder, 1867: 386. Syntypes (*Van der Capellen, Lorquin, Wallace*). At least one syntype, northern Sulawesi, in BMNH [examined].

Cethosia myrina myrina C. & R. Felder; Fruhstorfer, 1912: 506; Tsukada, 1985: 296; Vane-Wright & de Jong, 2003: 237; Peggie, 2011: 16.

Cethosia myrina myrina C. & R. Felder; Küppers, 2006: 16, pl. 16, figs 5–8. [In part.]

Küppers (2006) departed from previous

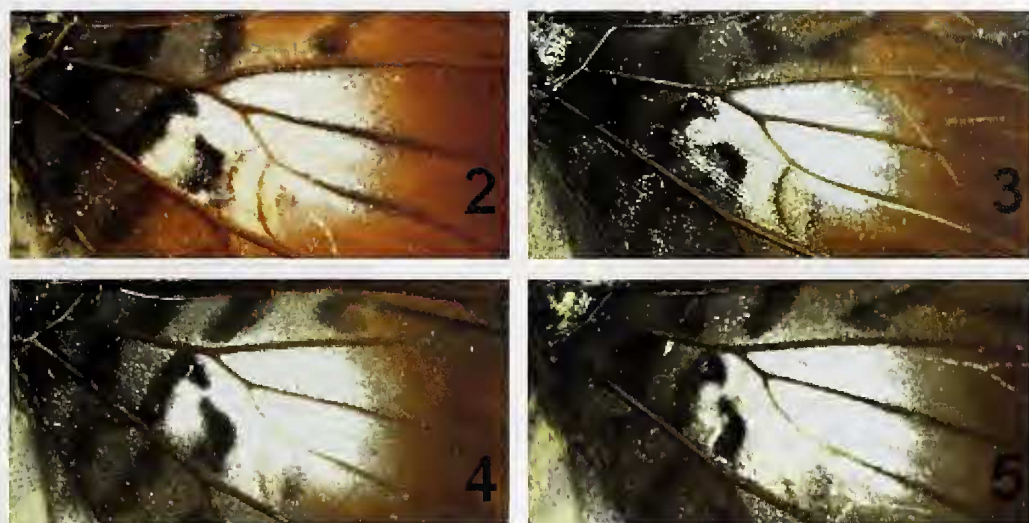
arrangements by including *C. m. sarnada* Fruhstorfer, 1912, described from the far south of Sulawesi, as a junior synonym of nominate *C. m. myrina*. Küppers gave the range of the revised nominate subspecies as northern, central and southern Sulawesi, with *C. m. melancholica* in central and eastern Sulawesi. Of the material he illustrates, a male from C-Sulawesi without further data appears somewhat intermediate between *melancholica* and typical *myrina* (Küppers, 2006: pl. 17, figs 1 & 2).

Based on colour pattern, *C. myrina* males from the northern peninsula of Sulawesi are indeed almost indistinguishable from males from the island's far south. However, in females the veins crossing the upperside hindwing white discal 'window' (notably cross-vein m_2-m_3) are slightly more extensively marked by blackish scales in northern material compared with southern. This is evident in Figs 2–5, and can also be appreciated from the illustrations in Tsukada (1985: 77: figs 3,4,9,12)—although there is some variation.

Subjectively, the southern population also appears to show greater sexual dimorphism than the northern. In the north, females are generally bright orange, almost male-like (but with less iridescent magenta-violet coloration), whereas in the south-west females are mostly duller, brown rather than orange on the hindwings (although Küppers, 2006: pl. 16, fig. 8, illustrates a female from Papayoto, northern Sulawesi, which is similar to typical south-western females). Dimorphism is marked in the central *C. m. melancholica* and in *C. m. ribbei* from Banggai, in which the females are predominantly charcoal grey-brown, lacking, respectively, the striking iridescent violet or blue of their males. *C. m. vanbemmeleni* from Buton and Muna has the hindwing extensively orange in the male, with females duller in contrast (Küppers, 2006: pl. 18, figs 5–8).

Despite Küppers' (2006) account, given that *C. m. melancholica* definitely occurs at Palu (Figs 1 & 8), it seems that *C. m. myrina* populations to the north of Palu are not directly connected with the very similar looking populations found in the far south-west. If so, then *C. m. myrina* sensu Küppers (2006) is a polytopic subspecies (Mayr, 1963: 349), with two major geographical subdivisions separated by a distinct subspecies (*melancholica*). This would seem to imply that gene flow between these subdivisions would be more restricted than within them. Given that the colour pattern differences in support of this possibility are slight and not entirely convincing, what other characters systems are available?

A molecular investigation would likely be the most powerful tool to answer this question but, as yet, no relevant data are available. Although Müller



Figures 2–5. Upperside hindwing discal cell of four female *Cethosia myrina*. 2, *C. m. myrina*, “N. Celebes”; 3, *C. m. myrina*, “N. Celebes”; 4, *C. m. sarnada*, “Maros”, southern Sulawesi; 5, *C. m. sarnada*, “Bonthain”, southern Sulawesi (all specimens in BMNH, London).

& Beheregaray (2010) analysed DNA data for two specimens attributed to “*C. myrina myrina*”, both came from southern Sulawesi. One was from “Salawatang, south Sulawesi” (Müller & Beheregaray, 2010), the other from Beso Valley, less than 100 km south of Palu (southern tip of Lore Lindu National Park, collected at 1450 m on 10.xi.2002, at 01°39.17’S, 120°10.64’E: Christian H. Schulze, pers. comm.). A specimen of *C. myrina ribbei* (Banggai archipelago) also analysed by Müller & Beheregaray showed very significant differentiation from these two (see below), indicating that a molecular study might well give a useful result. Available data on size, however, does give some evidence of north-south differentiation.

Males of *C. myrina* from northern Sulawesi (north of Palu) in the BMNH collection have the following forewing lengths (measured in mm): 49.2, 50.4, 52.7, 54.0, 49.1, 50.1, 55.4, 52.0, 53.2, 54.0, 57.2, 55.2, 54.0, 51.7, 52.3 (N = 15, mean \pm 1 SD = 52.70 \pm 2.36 mm). For females the values are: 52.6, 56.5, 51.3, 53.3, 53.8, 56.0, 58.8, 55.0, 57.1, 60.7, 57.3, 53.0 (N = 12, mean = 55.45 \pm 2.78 mm).

Males from southern Sulawesi (well to the south of Palu) are recorded as: 42.0, 42.3, 44.4, 45.4, 45.2, 47.5, 46.0, 49.5, 49.5, 51.1, 51.1, 50.5, 51.5, 50.8, 54.0, 51.1, 47.8, 47.2, 43.8, 47.0, 48.9, 48.2, 52.2 (N = 23, mean = 48.13 \pm 3.26 mm). Southern females have the following: 47.2, 50.0, 54.1, 53.0, 58.0, 58.3, 56.0, 57.7, 43.7, 47.0, 51.6, 53.7, 54.0, 50.9 (N = 14, mean = 52.51 \pm 4.43 mm).

These data suggest that, despite considerable

overlap, the mean forewing length of male *myrina* in northern Sulawesi is almost 5 mm greater than in southern Sulawesi. If the mean forewing lengths are squared, this suggests northern males could on average have a wing area up to 20% greater in extent than their southern counterparts. But is this difference statistically significant?

Comparing the forewing lengths of the two male samples (two-tailed *t*-test with unknown variances not assumed to be equal) gives a *t*-value of 4.68 (calculated manually, and checked using online program at http://www.physics.csbsju.edu/stats/t-test_bulk_form.html). With 36 degrees of freedom, this equates to a probability of less than 0.0001 for the null hypothesis that the two population means are the same.

The northern females sampled have a mean forewing length 2.9 mm greater than the southern females, with a *t*-value of 1.52. With 24 degrees of freedom, the probability for the null hypothesis that the two population means are the same is 0.14. Thus the observed difference in mean size for the female samples is not significant. However, this difference does have the same sign as that of the males, which do show a significant difference. On present evidence, it can be concluded that *C. myrina* from northern Sulawesi are larger than those found in the southern part of the island.

The difference in size could be clinal, but there are not enough data of sufficient quality available to explore this possibility. Another explanation



Figures 6–11. Images of the five subspecies of *Cethosia myrina* (all 'halved', with ups left and uns right). **6, 7,** *C. m. myrina* C. & R. Felder: male, "N. Celebes" (6), female, "N. Celebes" (7); **8,** *C. m. melancholica* Fruhstorfer, male, "G. Tompoe, Paloe, 2700 ft., West Celebes, Jan. 1937, J.P.A. Kalis"; **9,** *C. m. ribbei* Honrath, male, "Bangkei, H. Kühn, 1885"; **10,** *C. m. sarnada* Fruhstorfer, male, "région basse entre Maros & Tjamba W. Doherty 1896"; **11,** *C. m. vanbemmeleni* Jurriaanse & Lindemans, male, "Matanauwe, c. 8 km E, Bau Bau-Lasalimu Rd., Pulau Buton, 250 m, 24.viii.2000, K. Willmott". All specimens in BMNH London except Fig. 11, courtesy of Dr Keith Willmott.

could be the temperature–size rule, or its ecological counterpart, Bergmann's rule (Ray, 1960; Kingsolver & Huey, 2008; Meiri, 2011). The first rule indicates that, in general, the lower the temperature at which the progeny of a single pairing are raised, the larger the adults will be. There are, however, some well-

documented exceptions, notably in grasshoppers (e.g. Walters & Hassall, 2006). Bergmann's rule, originally proposed for endotherms, can be defined as "a tendency of organisms to be smaller at high temperatures and low latitudes and larger at low temperatures and high latitudes" (Meiri, 2011: 205).

In ectotherms, however, there are many exceptions, with taxa showing so-called converse-Bergmann latitudinal variation (see discussion and references in Kingsolver & Huey, 2008). For tropical and south-temperate butterflies, at least, there is some empirical evidence that Bergmann's rule can apply (Baker, 1972; Vane-Wright *et al.*, 1975). However, Brehm & Fiedler (2004) did not find any such correlation in a study of altitudinal size variation based on a sample of almost 1000 species of geometrid moths from southern Ecuador. At high latitudes, converse-Bergmann patterns of latitudinal intraspecific variation are frequent in butterflies (Nylin & Svård, 1991; Nygren *et al.*, 2008).

In the present case, the sample of northern Sulawesi *C. myrina* comes from a region that lies almost exactly between the equator and 2° N, while the southern sample comes from localities bounded by about 3–5.5° S. Thus, were the temperature–size or Bergmann's rules to apply to this species, other factors being equal (which they may not be) then, if anything, one would expect to find the reverse of the result reported above: the northern Sulawesi sample would be expected to be smaller than the southern. While there seems little point in discussing this further without data from far more extensive fieldwork and laboratory rearings, this finding gives some additional reason to consider that the size difference found between these two aggregates or populations, northern versus southern, could and perhaps should be treated as significant. On this basis, and their separation by the central Sulawesi race in the Palu region, it is proposed that the northern and southern groups should continue to be regarded as separate subspecies, *C. myrina myrina* and *C. m. sarnada*, until such time as they can be more extensively investigated using new data from molecular studies and extensive morphometrics.

***Cethosia myrina sarnada* Fruhstorfer, 1912, subsp. rev. (Figs 4,5,10)**

Cethosia myrina sarnada Fruhstorfer, 1912: 506, Pl. 110d (as “myrina”). Male, female syntypes, “Süd-Celebes, Bonthain” (= Mt Lompobattang) (*H. Fruhstorfer*).

Cethosia myrina sarnada Fruhstorfer; Tsukada, 1985: 296; Vane-Wright & de Jong, 2003: 237; Peggie, 2011: 16,17.

Cethosia myrina myrina C. & R. Felder; Küppers, 2006: 16, pl. 17, figs 3–4. [In part.]

Described from at least one male and one female (syntypes) from “Süd-Celebes, Bonthain” (= Mt.

Lompobattang), where it occurs, according to Fruhstorfer (1912: 506), up to 1000 m. The type material should be sought in the Muséum National d'Histoire Naturelle (MNHN), Paris. Note: the original description, even when interpreted by a native German-speaking lepidopterist (Michael Boppré, pers. comm.), is ambiguous regarding the type material. Only those specimens mentioned from “Bonthain” are certainly included. The type-locality is hereby restricted to the slopes of Mt. Lompobattang.

As discussed above, with some good reason Küppers (2006) departed from previous arrangements by placing *C. m. sarnada* as a junior synonym of *C. m. myrina*. Whether this does or does not create a polytopic subspecies, separated into two major halves by *C. m. melancholica* (Fig. 1), remains to be seen. On the evidence presented above, it is provisionally concluded that the traditional arrangement should be maintained, with *sarnada* applied to populations of *C. myrina* from the main south-western peninsula of Sulawesi. The only clear difference on present evidence is size, with male *sarnada* having a significantly shorter mean forewing length. The small difference noted in the coloration of the hindwing discal area of females (Figs 2–5) is not entirely convincing but might yet prove to be a good separation. Molecular and extensive biometric investigations are much to be desired.

***Cethosia myrina melancholica* Fruhstorfer, 1912 (Fig. 8)**

Cethosia myrina Felder, ♀ forma *melancholia* [sic] Fruhstorfer, 1909: 229. “Ost-Celebes, Mapane, Februar 1895, Drs. Sarasin leg., 1 ♀ Coll. Fruhstorfer, 2 ♀♀ Museum Basel, eine Anzahl ♀♀ von Paloppo, Coll. Martin.” [Infrasubspecific.]

Cethosia myrina melancholica Fruhstorfer, 1912: 506, pl. 110d. INDONESIA: Sulawesi. Unspecified number of male and female syntypes: East Sulawesi, Palopo (*Martin*); and Gulf of Tomini, Mapane, north of Lake Poso (*Sarasin*). [Specimens probably in MNHN Paris; ZSBS Munich; and NM Basel.] [Not examined.]

Cethosia myrina [♀ form] *melancholica* Fruhstorfer: *Martin*, 1921: 139.

Cethosia myrina melancholica Fruhstorfer, 1909 [sic]: Tsukada, 1985: 77, 78, 296; Vane-Wright & de Jong, 2003: 237; Küppers, 2006: 16, pl. 17.

Cethosia myrina melancholica Fruhstorfer: Talbot, 1923: 41; D'Abbrera, 1985: 273.

Cethosia myrina melancholica Fruhstorfer, 1912: Peggie, 2011: 16.

Central, eastern and south-eastern Sulawesi are

occupied by a bluish-violet subspecies (which includes a population on the Togian islands, Tomini Bay) that on the main island appears to separate the northern and southern races (Tsukada, 1985: 296; Fig. 1). This central race, distinguishable from the blue *C. m. ribbei* (see below), is currently referred to in major faunal works as *C. m. melancholica* Fruhstorfer, 1909 (e.g. Tsukada, 1985; D'Abbrera, 1985; Vane-Wright & de Jong, 2003). Unfortunately, it appears necessary to change either the spelling of this name or its date of publication. It is proposed here that it is better to change the date rather than the spelling.

The first name to be applied to *C. myrina* from this part of Sulawesi was introduced in the form "*Cethosia myrina* Felder, ♀ forma *melancholia* [sic]" (Fruhstorfer, 1909: 229). Fruhstorfer's original description refers only to the female sex and only lists female material. The name *melancholia* Fruhstorfer, 1909, was therefore conferred on an "infrasubspecific entity" in terms of the International Code of Zoological Nomenclature, as it refers to "specimen(s) within a species differing from other specimens in consequence of intrapopulation variability (e.g. opposite sexes . . . seasonal forms . . . variants of noninterrupted variability or polymorphism . . .)" (ICZN, 1999: 107).

However, under the current Code (ICZN, 1999: Articles 10.2, 45.6), the fact that this name was originally proposed as an infrasubspecific entity does not automatically bar it from use as an available name of the species group "if, before 1985, it was either adopted as the valid name of a species or subspecies or was treated as a senior homonym." (ICZN, 1999: Art. 45.6.4.1).

Fruhstorfer's (1912) account of *C. myrina* in 'Seitz' recognised four subspecies, and this was the system, with addition of the island race from Buton, adopted by Tsukada (1985). For whatever reason, in recognising the existence of a central to eastern Sulawesi race, Fruhstorfer (1912) used a different spelling from his 1909 form name. Thus the two names could be seen as independent proposals. Moreover, they cannot be construed as homonyms—and it is the later, 1912 spelling that has been adopted in all printed works referring to this taxonomic segregate as a subspecies, from Fruhstorfer in 'Seitz' to Küppers in 'Bauer' (2006)—see synonymy above.

D'Abbrera (1985: 273) also proposed five subspecies for *C. myrina*, but not quite the same five as Tsukada (1985): *C. m. myrina*, *C. m. sarnada* and *C. m. vanbemmeleni* were the same, but he treated *C. m. ribbei* and *C. m. melancholica* differently and ambiguously. D'Abbrera's four images labelled as "*ribbei*" comprise two specimens from Peleng (*ribbei sensu stricto*), and

two from Palu (one indicated as a type). In his text he referred to all four under the heading "*myrina* ? subsp./ ? forma", noting that the Palu material had "a close resemblance to the race from Banggai described as *ribbei* – which itself is probably only a d.s.f. [dry season form]." Finally, he included *C. m. melancholica* from eastern Sulawesi, which he described as "A large melanotic form, probably the w.s.f. of the eastern population of *myrina*."

Examination of the Natural History Museum London (BMNH) collection reveals that D'Abbrera (1985) must have considered creating a new, separate subspecies for the Palu population, as the Palu specimen he figured as if it were a holotype is labelled as the "type" of an unpublished D'Abbrera manuscript name pinned in the Rothschild Collection. This specimen fits very well with *C. m. melancholica* from Palu and Palopo, as illustrated by Tsukada (1985), and as *melancholica* by Küppers (2006). However, according to Chris Müller (in litt., 2011), specimens he obtained from a collector at Palopo "are very orange", not bluish, and so further work on the distribution and variation of *C. myrina* within the area currently considered to be occupied by subspecies *melancholica* (Fig. 1) may be needed.

Subject to the legal restrictions that apply to collecting this species, it would appear desirable to obtain fresh material from a range of localities for molecular work. In the process, any future reviser should be free to select the most appropriate syntype specimen, male or female, from Palopo or Mapane, as the name-bearing (lecto)type for *Cethosia myrina melancholica* Fruhstorfer, 1912.

Size: Males in BMNH have forewing lengths of 41.0–53.7 mm (N = 6, mean ± 1 SD = 50.8 ± 4.86 mm). No females available. On this slender evidence *C. m. melancholica* might be intermediate between *C. m. myrina* and *C. m. sarnada*, suggesting the further possibility that within the main island of Sulawesi there could be a north–south cline for decreasing size.

Cethosia myrina ribbei Honrath, 1887 (Fig. 9)

Cethosia myrina var. *ribbei* Honrath, 1887: 296, pl. 6, fig. 3 (male). INDONESIA: Sulawesi, Kep. Banggai [Peleng]. "Ins. Bangkai (östlich von Celebes)". 12 male, 3 female syntypes. [At least two syntypes in BMNH; examined.]

Cethosia myrina ribbei Honrath: Fruhstorfer, 1912: 506; Tsukada, 1985: 77, 78, 296; D'Abbrera, 1985: 273 (as subspecies or dry season form); Vane-Wright & de Jong, 2003: 237; Küppers, 2006: 16, Pl. 17; Peggie, 2011: 16.

Note: the date of original publication for *ribbei* is

cited as 1886 in most recent publications, including Peggie (2011), but the correct date is 1887 (G. Lamas, pers. comm.).

C. myrina ribbei occupies the Banggai Archipelago (definitely recorded from Peleng and, apparently, Banggai Island), which lies about 20 km off the south coast of the central eastern peninsula of Sulawesi, close to its eastern tip. D'Abrera (1985) introduced a note of uncertainty regarding this subspecies, suggesting that it might represent nothing more than a dry season form of *C. m. melancholica* from the adjacent areas of eastern Sulawesi. However, although the two are similar in some respects, the colour pattern of *ribbei* is distinct and constant (notably the 'royal' blue colour of the male and, in both sexes, the large, half-moon shaped white mark in the centre of forewing cell CuA_2), and there seems no reason on present evidence not to regard the two as distinct.

If one accepts the BEAST/DIVA tree based on three data points presented by Müller & Beheregaray (2010: fig. 4), then *C. myrina ribbei* diverged from *C. myrina* in south-western Sulawesi (see discussion under *C. m. myrina* above) about 3–5 million years ago. Unfortunately there are no data concerning its possible divergence time from the eastern main-island population. To put a time-span of 3–5 million years into some context, according to May *et al.* (1995: 20), the "average lifespan of animal species in the fossil record, from origination to extinction, is around 10^6 – 10^7 years," while Ae (1988: 496) suggested that *Papilio* could achieve full species status after "one million years of almost perfect isolation." On this basis the present molecular evidence, although slight, is consistent with the hypothesis that this subspecies represents a distinct entity.

C. myrina ribbei is the smallest of the five subspecies (Küppers, 2006: 16). Honrath (1887) recorded the wingspan of 12 males as 79–82 mm, and of 3 females as 84 mm. Males in BMNH have forewing lengths of 39.7–49.2 mm ($N = 6$, mean ± 1 SD = 46.53 ± 3.50), while the single female available has fwl 50.0 mm exactly.

***Cethosia myrina vanbemmeleni* Jurriaanse & Lindemans, 1918 (Fig. 11)**

Cethosia myrina bemmeleni [sic] Jurriaanse & Lindemans, 1918: 256. One male, one female syntypes, INDONESIA: Sulawesi, Buton (male: Boeton, xi.1916, *N.H. Krans*; female: Boeton, 1909, *T. Elbert*). [Presumed now to be in Naturalis, Leiden.] [Not examined.]

Cethosia myrina vanbemmeleni: Jurriaanse & Lindemans, 1920a: xlvi. [Short diagnosis; no



Figure 12. *Cethosia myrina vanbemmeleni*, Kakenauwe, Lambusango, Buton, Sulawesi Tenggara. Photographed by Nurul Winarni, and reproduced here with permission.

reference to 1918 description; one male only mentioned in text.]

Cethosia myrina van bemmeleni [sic]: Jurriaanse & Lindemans, 1920b: 21. [Refers to 1918 description; one male only mentioned in text.]

Cethosia myrina vanbemmeleni Jurriaanse & Lindemans: Jurriaanse & Lindemans, 1920b: 88, pl. 4, two figures ('526': male, female).

Cethosia myrina vanbemmeleni Jurriaanse [sic]: Martin, 1921: 141.

Cethosia myrina vanbemmeleni Jurriaanse & Lindemans, 1918: Vane-Wright & de Jong, 2003: 237; Peggie, 2011: 16.

Cethosia myrina vanbemmeleni Jurriansz [sic]: D'Abrera, 1985: 273.

Cethosia myrina vanbemmeleni Jurriaanse [sic] & Lindemans, 1918: Tsukada, 1985: 77, 296; Küppers, 2006: 16.

Cethosia myrina vanbemmelleni [sic]; Küppers, 2006: pl. 18, figs 4–8.

Current usage of this name is based on Jurriaanse & Lindemans' subsequent spelling *vanbemmeleni* (the taxon was named after Professor J. F. van Bemmelen), which the authors introduced in two different publications in 1920 without an explicit justification for the change from their original 1918 spelling, *bemmeleni*. The 1920 spelling has however been universally applied. If we regard *vanbemmeleni* as an incorrect subsequent spelling in "prevailing usage" (ICZN, 1999: 121), then in accordance with Article 33.3.1 (ICZN, 1999: 43) and in the interests

of stability, the original authors' subsequent action and its adoption could be deemed to have created a correct original spelling. However, despite the lack of explanation for the spelling change that the original authors subsequently adopted, as suggested by Andrew Brower (pers. comm.), it appears better to regard this as an *emendation* rather than an incorrect subsequent spelling (very plausibly Professor van Bemmelen pointed out to the authors that 'van' was part of his surname and should be included). In which case, this being an unjustified emendation in prevailing use, it can now be deemed to be a justified emendation still bearing the original date and authorship under Article 33.2.3.1 (ICZN, 1999: 42).

Either way, I propose continuing acceptance of *Cethosia myrina vanbemmeleni* Jurriaanse & Lindemans, 1918, as the correct spelling, authority and date for the name applied to the Buton population of *C. myrina*. My justification is the statement of W.D.L. Ride: "In most cases an author will be required to maintain the particular spelling in prevailing usage for a name, even if it is found not to be the original spelling" (ICZN, 1999: xxviii). The name *C. m. bemmeleni* has never been employed by anyone in a printed work (other than *Zoological Record*) since its description, including the original authors who, for whatever reason, used *vanbemmeleni* instead in a follow-up note and a paper only two years later.

In passing, it should be noted that the authors' names have frequently been misquoted, the double-r and double-a spelling of Jurriaanse causing particular difficulty.

Coloration: the almost obsolete white 'window' on

the hindwing upperside disc is the most notable feature of this subspecies together with, in museum material at least, the relatively uniform orange coloration of the upperside hindwing and posterior area of the forewing (Fig. 11). However, in living or very fresh material the posterior area of the forewing has a strong pinkish-magenta suffusion (Fig. 12), which fades soon after death – as often seen in the 'red' of *Heliconius* species, which can change from pinkish-red in living material to orange post mortem.

Size: the one male available in BMNH has a forewing length of 50.8 mm. The images in Tsukada (1985) and Küppers (2006) are consistent with the idea that this island race is larger than *C. m. ribbei*. All five subspecies can be separated using the key below.

Discussion: the ontological status of *myrina* subspecies

Despite periodic expressions of doubt about the nature and utility of subspecies (e.g. Wilson & Brown, 1953; Hennig, 1966: 46–57; Barrowclough, 1982; Vane-Wright & Tennent, 2011), most butterfly taxonomists willingly and often uncritically embrace the concept, with a seemingly endless flow of new subspecies still being described (see *Zoological Record* for the past 120 years). In practice the increasing availability of DNA data raises a growing number of empirical questions about the validity of many subspecies—many over-split, some apparently under (e.g. Tsao & Yeh, 2008; Makowsky *et al.*, 2010).

In the present case there has been little change in the division of *Cethosia myrina* into three subspecies on the main island of Sulawesi, together with two offshore

Key to subspecies of *Cethosia myrina*

The five subspecies of *Cethosia myrina* recognised here can be separated by the following key—although the phenotypic separation of the nominate subspecies and *C. m. sarnada* is exceptionally weak:

- 1 Upperside hindwing without pure white 'window' or patch covering base of cells R_5 and M_1 (which also extends to the distal part of the discal cell), this area at most slightly paler than the extensively orange or (very limited) purplish-brown discal and postdiscal areas of the wing (Fig. 11) (Buton, Muna) *C. m. vanbemmeleni* Jurriaanse & Lindemans, 1918
- Upperside hindwing with a clear white 'window' or patch covering base of cells R_5 and M_1 , extending into the distal area of the discal cell 2
- 2 Hindwing upperside of male with cells R_5 and M_1 distal to the white 'window,' and cells M_2 – CuA_2 extensively blue or violet, not brown or purplish brown 3
- Hindwing upperside of male with cells R_5 and M_1 distal to the white 'window,' and cells M_2 – CuA_2 distinctly tinged with or extensively coloured brown and / or purplish brown 4
- 3 Forewing conspicuously marked with clear white spots, most notably a large white postdiscal chevron-shaped mark in cell CuA_3 , which is at least 3.5 mm wide at its widest point; cells M_2 – CuA_2 in male extensively blue (Fig. 9) (Banggai Archipelago)..... *C. m. ribbei* Honrath, 1887
- Forewing not conspicuously marked with clear white spots, at most a small, usually rather indistinct, whitish spot or chevron-shaped mark in cell CuA_3 , at most 3 mm wide at its widest point and usually much smaller; cells M_2 – CuA_2 in male extensively violet (Fig. 8) (central regions of Sulawesi, from Palu to Palopo, eastern Sulawesi, and Togian islands) *C. m. melancholica* Frushstorfer, 1912
- 4 Larger subspecies (male forewing length 49–56 mm); in females veins crossing the white discal hindwing 'window' slightly more extensively marked by blackish scales (Figs. 2,3,6,7) (northern Sulawesi) *C. m. myrina* C. & R. Felder, 1867
- Smaller subspecies (male forewing length 42–54 mm); veins crossing the white discal hindwing 'window' of females slightly less extensively marked by blackish scales (Figs. 4,5,10) (south-western Sulawesi) *C. m. sarnada* Frushstorfer, 1912

island races, for almost a century. The only shift has been Küppers (2006) attempt to synonymise the northern and southern mainland subspecies as one, a decision reversed above on the evidence of size and the apparent division of the two by the central race. Is the traditional subdivision of this distinct species-level taxon justifiable in light of the continuing debate about the utility of subspecies?

Here, as in all areas of taxonomy, we run into problems of diverse underlying philosophy (Vane-Wright, 2001). In the case of subspecies, a non-obligate rank in the taxonomic system, there is currently a notable tension between a cladistic approach, with a desire for monophyly, and a purely empirical approach. According to the latter view, names for allopatric populations or groups of populations within a species that can be distinguished have heuristic value. If later research shows that such named subspecies are not useful, because they fail to capture or express anything of real biological significance, they can simply be synonymised without affecting the (obligatory) species name.

The problem with the cladistic or phylogenetic approach is that it can lead to taxonomic inflation (Isaac *et al.*, 2004); empiricism, on the other hand, readily brings about a proliferation of potentially meaningless subspecific taxa that can be misleading biologically, and may also devalue attempts to set meaningful conservation priorities. Such divisions have long been a bane of work on *Parnassius*, and now appear to be affecting, for example, *Ornithoptera*. In light of these concerns, how do the five subspecies of *Cethosia myrina*, a species protected under Indonesian law, compare?

In comparison to main-island *C. myrina*, both the offshore island populations are readily and reliably diagnosable on color and color pattern, as indicated above. Moreover, the existing DNA data suggest that *C. m. ribbei* (from Banggai Archipelago) diverged from at least one of the main-island populations several million years ago; no such data are available for *C. m. vanbemmeleni* (from Buton and Muna) but, given the striking change in color pattern, this may also represent a long-separate lineage. There would seem no grounds to synonymize these taxa with each other or any of the main island populations. From a phylogenetic or cladistic perspective they could well be full species—but to recognize them as such, at least at this stage in our understanding, would not appear helpful. On available evidence they are clearly peripheral representatives of the main-island taxon.

On the main island, were it not for the existence of the distinctive and somewhat *ribbei*-like central subspecies *C. m. melancholica*, from which *ribbei* would appear to have been derived, and which

apparently separates the main northern and southern populations, the case to synonymize *C. m. sarnada* with the nominate subspecies, as proposed by Küppers (2006), would seem strong—albeit with a possible south to north cline for increasing adult size. Thus the argument in favor of keeping *C. m. myrina* and *C. m. sarnada* separate is simply empirical—the hypothesis is that when other character systems are examined in depth (e.g. molecular characteristics) they will be found to differ. In this case maintaining the separate subspecies hypothesis is a stimulus to further research.

These differences in fundamental approach to recognizing subspecies even within a single polytypic species can only be justified on the basis that taxonomy is (inevitably?) a fractal pattern of doubt and certainty (Vane-Wright, 2003), a work forever in progress. This is particularly the case at the species level, which occurs at a notable boundary between pattern and process. We are invited to steer between Scylla and Charybdis: the multi-headed monster of taxonomic inflation on one hand, the whirlpool of excessive lumping on the other. Plus ça change? Simpson (1961: 110) suggested that, in some ways, classification should be seen as “a useful art”. When it comes to recognizing subspecies or not, perhaps he was right!

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